ANNEX 1

MPAs AND MPA NETWORKS IN THE HIGH SEAS

The 1982 United Nations Convention on the Law of the Sea (UNCLOS) is often referred to as the 'constitution for the oceans'. It clearly distinguishes between areas of the ocean under national jurisdiction and those beyond, which are generally referred to as the high seas or 'the Area'.[1] Because they are outside national jurisdictions, environment and fisheries governance in the high seas and in 'the Area' pose particular challenges, which also obviously reflect on the opportunities to designate and manage MPAs and MPA networks. A number of efforts have been made to improve fisheries management beyond the limits of national jurisdiction, for example through regional fisheries management organizations or arrangements (RFMO/As),[2] but there is still limited experience in implementing MPAs, both in the field of fisheries management and in biodiversity conservation.

GOVERNANCE REGIMES FOR THE HIGH SEAS AND AREAS BEYOND NATIONAL JURISDICTION

UNCLOS provides the general framework for establishment of conservation and management measures in the high seas, but is not exhaustive in terms of elaborating the mechanisms or tools for conservation. It does, however, provide that coastal states and states that engage in fishing in the high seas must seek "to agree on the measures necessary to coordinate and ensure the conservation and development of such stocks".[3] Moreover, it also envisages the protection of "rare or fragile ecosystems", and where living marine resources are "depleted, threatened or endangered", their habitats are to be protected.[4]

[1] See Glossary for definitions of these terms as they are used in the Guidelines.

[2] The mandates of Regional Fishery Bodies vary. Those that have a management mandate are called regional fisheries management organizations (RFMOs). They adopt fisheries conservation and management measures that are binding on their members. The difference between a RFMO and a regional fisheries management arrangement (RFMA) is that the former has established a Secretariat that operates under a governing body of member States, while the latter has not.

[3] Article 63.

[4] Article 194.

The 1995 Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (the FAO Compliance Agreement) and the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (the United Nations Fish Stocks Agreement) are also relevant – and build directly on provisions contained in UNCLOS. The former emphasizes the primary responsibility of a flag State[5] to exercise control over vessels entitled to fly its flag, while the latter underscores the duty of states to cooperate in the conservation and management of straddling and highly migratory fish stocks.

Together these instruments form the legal framework against which marine living resources in the high seas are managed by states and through RFBs. When viewed collectively, these instruments confirm that in such areas states enjoy the freedom to allow their nationals to engage in fishing activities. However, this freedom is not unfettered: it is subject to an obligation to protect the marine environment, to protect and conserve living marine resources and to cooperate with other states for conservation purposes.

The Convention on Biological Diversity is also relevant to the high seas and to *in situ* protection of marine biodiversity. The scope of the convention includes marine areas within areas of national jurisdiction and beyond, in relation to its areas of competence. The CBD generally operates through national implementation. The convention emphasizes the overall global objective of conservation of biodiversity.

The International Guidelines for the Management of Deep-Sea Fisheries in the High Seas (FAO, 2009c) were adopted in August 2008. These guidelines provide advice not only on how to manage deep-sea fisheries, but also on how to take conservation of these resources into consideration. They list criteria for the identification of vulnerable marine ecosystems (VMEs) and potential management responses from states or RFBs, including the establishment of spatial management measures such as MPAs.

Specific activities that occur in or impact the high seas or areas beyond the limits of national jurisdiction, namely shipping and deep-sea mining, are also subject to special international legal regimes. Relevant aspects of these

[5] The flag State in relation to a fishing vessel is the State under whose laws the fishing vessel is registered or licensed.

BOX 34
Additional international instruments relevant to biodiversity conservation, sustainable fisheries and MPAs in the high seas

A number of international instruments and agreements are applicable to the high seas. In addition to the instruments listed in Box 12 in Chapter 5, agreements that are specifically relevant to the high seas include, but are not limited to:

Hard law:

- Agreement relating to the implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982
- Convention for the Regulation of Whaling

Soft law:

- International Guidelines for the Management of Deep-Sea Fisheries in the High Seas (FAO, 2009c)
- United Nations Resolutions 61/105 – Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks and related instruments.

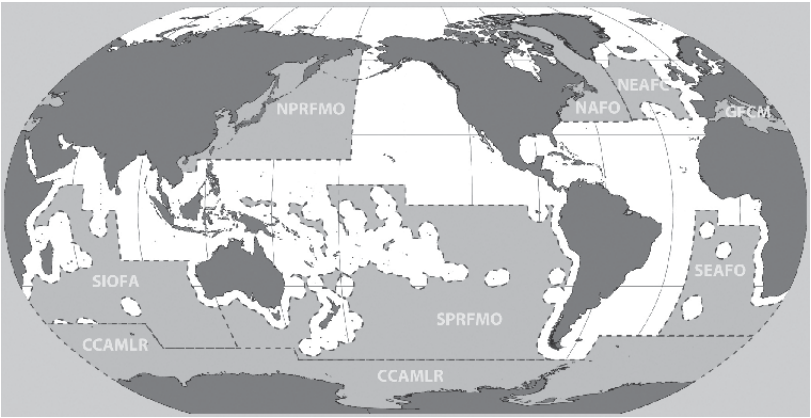
regimes are discussed below under "Spatial management measures in the high seas".

Other international instruments – both 'hard' law (binding) and 'soft' law (voluntary instruments) – are of relevance to environmental and fisheries management, both in waters under national jurisdiction and in the high seas. Some of these were also mentioned in Chapter 5, Box 34 provides a list of additional instruments.

Regional fishery bodies (RFBs)

Currently, there are nearly 50 RFBs worldwide, only about half of which are RFMO/As with a management mandate. However, only a limited number of RFMO/As are able to institute binding measures on members in areas beyond national jurisdiction. As of January 2010, the following RFMO/As had the legal competence to manage discrete demersal fisheries. These include the Commission on the Conservation of Antarctic Marine Living Resources

FIGURE 8
Competence areas of RFMO/As



(CCAMLR); the General Fisheries Commission for the Mediterranean (GFCM); the Northwest Atlantic Fisheries Organization (NAFO); Northeast Atlantic Fisheries Commission (NEAFC); and the South East Atlantic Fisheries Organization (SEAFO). Other RFMO/As are being negotiated or await ratification, such as the recently negotiated South Pacific Regional Fisheries Management Organization (SPRFMO), the Southern Indian Ocean Fisheries Agreement (SIOFA), and the North Pacific Fisheries Commission (NPRFMO) (see Figure 8).

Special considerations for high seas fisheries and habitats

High seas fisheries target pelagic and demersal fisheries. Targeted pelagic fish generally include tuna and tuna-like fish. These fisheries are extensively managed by RFBs. Due to varying issues, RFBs, for the most part, have not chosen to use MPAs as a conservation and management mechanism.

With regard to demersal fisheries, current fishing practices have potentially significant effects on vulnerable species and habitats in the high seas (as in waters under national jurisdiction). The establishment of MPAs in the high

seas based on the principles of the precautionary and EAF approaches may constitute an important tool to prevent or reduce such negative outcomes.

Deep-sea fisheries in the high seas, which typically target demersal and bentho-pelagic species, have been identified as a possible threat to vulnerable species and habitats. Two characteristics of these fisheries make them of particular concern. First, some species targeted may only be able to sustain a low exploitation rate due to the fact that they are slow-growing, long lived or late maturing. Second, fishing gear is often utilized that is in contact or is likely to be in contact with the seafloor during the fishing operation. Many of these fisheries are conducted on isolated oceanic topographic structures such as seamounts, ridge systems and banks, but also in the deep superjacent waters lying above the continental shelf.

Negative effects on VMEs may occur in one of two ways, either through damage to structural elements or damage to the ecosystem, for example by the removal of a species, which alters the way in which the ecosystem functions. The most vulnerable ecosystems are those that are both easily disturbed and slow to recover.

Spatial management measures in the high seas

At present, spatial management measures that regulate or restrict human activities in the high seas have only been created within sector-specific contexts, that is, by RFMOs or under conventions or agencies such as the IMO.[6]

RFMOs that regulate deep-sea fisheries have begun protecting benthic marine environments in the high seas by introducing closures in which the use of certain gears, particularly bottom-contact ones, is banned. For example, SEAFO has identified a number of vulnerable marine areas and temporarily closed some of these areas to bottom-fishing pending further research. NAFO has closed five seamount areas and 12 additional areas containing high concentrations of corals and sponges to bottom-contact gears. GFCM has prohibited trawling in areas deeper than 1 000 m and has declared three closed areas to protect sensitive habitat.[7] NEAFC also closed five areas on the mid-Atlantic ridge in 2009, added to the five already closed in the Rockall-Hatton Bank area in 2007.

[6] See also Chapter 5, Section 5.2, "What are the main international legal frameworks relevant to MPAs?"

[7] GFCM Recommendation REC-GFCM/30/2006/3.

The ISA was established to regulate deep seabed mining in marine areas beyond the limits of national jurisdiction (the Area) and to protect the marine environment from any harmful effects of mining activities, including exploration. It is currently developing criteria for a "preservation reference zone" in relation to nodule mining. An example is the Clarion-Clipperton Zone of the Pacific Ocean, where a preservation reference zone is being considered as part of the design for an MPA for seamounts and abyssal nodule provinces in the Pacific. In this particular zone it is proposed that no mining or exploration should take place.

In 2008, the CBD conference of the parties adopted scientific criteria (COP Decision IX/20, paragraph 14) for identifying ecologically or biologically significant marine areas in need of protection, and scientific guidance for designing representative networks of MPAs. These scientific criteria are designed to apply to the open ocean, including areas beyond national jurisdiction. However, the criteria are to be applied to the scientific identification of ecologically and biologically sensitive areas (EBSAs) and do not have management implications.

IMO is mandated to establish a regulatory framework for international shipping that includes environmental concerns. IMO has two types of spatial management tools at its disposal: 'special areas' and 'particularly sensitive sea areas' (PSSAs). Special areas include specific restrictions on discharges and pollution from shipping. PSSAs are a slightly broader tool and require specific prohibitions, restrictions and application of measures, such as strict restrictions on discharge (through MARPOL) and equipment requirements for ships, such as oil tankers; routing measures to redirect vessels away from sensitive areas; and installation of vessel traffic services to improve vessel safety. In October 2009, IMO had recognized 12 PSSAs, including the Great Barrier Reef in Australia and the Baltic Sea. No PSSAs have yet been declared in the high seas, though the tool does allow for use in areas beyond national jurisdiction, and proposals for high seas PSSAs are being developed. In this respect IMO is important, as it provides an existing, globally accepted international mechanism for the establishment of protected areas in relation to shipping activities.

Future prospects for MPAs in the high seas

Fisheries management and biodiversity conservation pose particular challenges in the high seas with regard to legal and institutional structures and processes, as the areas are beyond national jurisdiction. The current major threat to the open oceans is considered to be fishing, but tomorrow other activities that

constitute potential threats to marine biodiversity may increase – such as bioprospecting, mining, energy development and CO_2 sequestration – requiring a more complicated set of management arrangements.

In spite of these challenges, there are positive developments. RFBs now manage the majority of the world's marine fish resources, although, unfortunately, too few target stocks are sustainably managed. In the face of this, the international community has reiterated the vital role of RFBs and the need to strengthen and modernize them. The Conference on Governance and High Seas Fisheries and the United Nations Fish Stocks Agreement – Moving from Words to Action was held at Saint John's, Newfoundland and Labrador, Canada, 1–5 May 2005. The ministers invited by Canada to participate in a round table concurrent with the conference issued a declaration in which they recognized that RFBs "are the most effective means of cooperating in the conservation and management of high seas fish stocks." They also recognized that RFBs today face new challenges and responsibilities and that there is a need for political will to further strengthen and modernize them.[8]

Many RFBs are working to strengthen governance through performance reviews, promotion of transparency, enhancement of MCS measures and implemention of EAF and the precautionary principle. RFMOs have also been moving towards increased cross-sectoral coordination and collaboration (Box 35). Industry also has an important part to play, and may collaborate to voluntarily form protected areas (Box 36).

[8] The need to further strengthen and modernize RFMOs was also recognized in the 2006 and 2010 United Nations Fish Stocks Review Conference, UNGA Resolutions, FAO Committee on Fisheries and other forums.

Box 35

Work by the North East Atlantic Fisheries Commission (NEAFC)

The north-east Atlantic has been one of the few areas where various management agencies have been working across sectors to protect vulnerable marine species and ecosystems. NEAFC has introduced a number of interim areas closed to bottom-trawling and other static gears within the regulatory area, in an effort to protect and preserve VMEs where they have been identified. In conjunction with its counterpart in the north-east Atlantic, the OSPAR Commission (for the protection of the marine environment of the north-east Atlantic), NEAFC has sought to harmonize environmental protection across the region by signing a memorandum of understanding. By working cooperatively and ensuring a free flow of information between the two bodies, it will ensure that the areas under their jurisdiction are subject to uniform governance.

NEAFC has stated that "Fishing is totally dependent on healthy ecosystems and clean oceans. NEAFC, as the competent organization for regulating fisheries in the high seas of the North East Atlantic, hopes that cooperation with other organizations in the regulation of other human activities in the oceans will ensure that no irreversible changes in environmental quality take place" (NEAFC, 2009). It has also recently entered into a cooperation agreement with IMO and is considering entering into one with ISA as well.

Source: NEAFC press release embargoed 11 December 2009, 09:00 am GMT (available at www.neafc.org/system/files/10122009_imo_pressrelease.pdf).

BOX 36

Southern Indian Ocean Deepwater Fishers' Association (SIODFA) and benthic protected areas

Four major fishing companies have come together to form SIODFA. This association has voluntarily adopted measures to cease bottom- and mid-water-trawling in eleven benthic-protected areas in the southern Indian Ocean. Within these areas, bottom-trawling and dredging are forbidden by SIODFA members. In addition, members have pledged to share scientific data collected by the organization and have instituted other measures to improve fisheries management while no regional management regime exists.

Source: Shotton, 2006.

ANNEX 2

WHAT AMOUNT OF MARINE PROTECTED AREA IS NEEDED TO SUSTAIN FISH POPULATIONS?

The effectiveness of MPAs in sustaining resource populations – inside and outside MPAs – and their effect on fishery yield is more difficult to assess than the biological response within MPAs. MPAs contribute to sustaining populations by allowing a higher proportion of the animals within them to survive long enough to mature and breed, thus increasing the reproductive output of the populations above what it would have been without MPAs. Clearly, if enough of a population is afforded protection in an MPA, the population will persist, regardless of the intensity of fishing outside the MPA. The question is, how much area is enough? The answer has two parts. First, how much spawning output is enough? Second, how effectively will MPAs protect fish populations so that enough of them can reproduce, that is, how to design MPAs that effectively control fish mortality?

SPAWNING PER RECRUIT AND MOBILITY

How much spawning output is enough can be addressed in terms of lifetime spawning per recruit (SPR) relative to an unfished population.[1] A review of empirical evidence provided a variety of estimates of the SPR necessary to sustain a population, ranging from 20 to 35 percent (Mace and Sissenwine, 1993). The lower value corresponds to an estimate of the minimum level necessary to sustain populations and the higher value corresponds to the level leading to a population abundance corresponding to maximum sustainable yield. Other studies conclude that 35–40 percent of the unexploited SPR is necessary for MSY, although even higher values may be appropriate for some species (Clark, 1990; Myers, Bowen and Barrowman, 1999; Ralston, 2002).

The effectiveness of MPAs in protecting fish so that they can reproduce depends also on the mobility of the fish once they reach the size or age vulnerable to fishing (both juveniles and adults). Suggestions that 20 percent of marine habitat be set as an MPA target were based on the desire to achieve at

[1] See Sissenwine and Shepherd, 1987, for the rationale behind this approach.

least 20 percent SPR for sedentary species.[2] Thus, if 20 percent of recruits settle in MPAs on average, and they are completely protected and do not migrate across MPA boundaries, protecting 20 percent of the area inhabited by the species should allow the population to be sustained, regardless of the intensity of fishing outside the MPA – if 20 percent SPR is enough. Clearly, the area that needs to be protected increases as the mobility of the species increases, so that fixed-location MPAs will not be a realistic option for sustaining highly mobile species. On the other hand, the amount of area that needs to be protected to sustain the population decreases as intensity of fishing outside of the MPA decreases, as some fish that migrate outside MPA boundaries will survive long enough to spawn.

MPA SIZE AND SPACING

Models have been used to evaluate the size and spacing of MPAs needed to sustain a population. Assuming that the biomass within the MPA is sufficiently large to be self-sustaining (also taking environmental variability into account), that conditions that affect dispersal of eggs and larvae do not vary spatially and that spawning only occurs within MPAs, a single MPA will sustain a population if the typical distance that eggs and larvae disperse is equal to or less than the linear dimension of the MPA (Botsford, Micheli and Parma, 2007). The size of the population will be a function of the size of the MPA. In this case, reproduction within the MPA will supply the MPA with recruits. If the dispersal distance of eggs and larvae exceeds the linear dimension of individual MPAs, the total fraction of area protected by MPAs must equal or exceed the SPR needed to sustain the population. Under the assumption of random dispersion of eggs and larvae (which is not always the case), the spacing of MPAs in a network is not very important for sustainability as long as the total fractional area protected is adequate (equal to or greater than a sustainable level of SPR) (Kaplan and Botsford, 2005).[3]

EXPORT OF EGGS AND LARVAE

Evidence of the export of eggs and larvae from MPAs and effects on recruitment have also been reviewed (Botsford, Micheli and Parma, 2007). While the number of studies is not large, there is some suggestive evidence of

[2] See NRC, 1999, 2001. It should also be noted that the World Parks Congress has called for strictly protected MPAs covering 20–30 percent of each habitat to contribute to a global target for healthy and productive oceans by 2012.

[3] See also "Modelling networks of MPAs to sustain fish populations" in Annex 3.

the beneficial effect of MPAs on reproductive output and recruitment outside MPAs. For example, there is documentation of larval export and an increase in queen conch larvae production within a 409 km^2 no-take area in the Bahamas (Stoner, Mehta and Ray-Culp, 1998). Also, areas of intense fishing for sea scallops on Georges Bank correspond to the location where a biophysical model of passive larvae drift from a 20 000 km^2 protected area has been used to predict the main juvenile settlement (Murawski *et al.*, 2000). In other situations, however, the effect on recruitment is difficult to demonstrate. In a large protected area where sea scallop was intensively exploited, the protection afforded by closing a large area to fishing and reductions in effective fishing effort outside the closed area – as a result of several management interventions (such as a reduction of more than 50 percent in days of fishing allowed) – contributed to an improvement in the resource, with biomass increase by a factor of 31 inside the MPA, and by a factor of 6 outside closed areas during the same time period.

Despite this, however, there was no significant difference in average recruitment (Hart, 2005, p. 6). Thus this dramatic improvement in the status of sea scallops in the area seems to have been a result of increased survival of recruits, not reproductive output. In summary, there is some evidence that eggs and larvae are indeed exported from MPAs, but, at the same time, there is little evidence of a positive effect on recruitment. This is not unexpected, given the high variability of recruitment success in most marine species. It is nevertheless reasonable to expect that MPAs may function as insurance if the stocks outside them become very seriously depleted. Improved monitoring and research on the dynamics of recruitment of marine species are needed to better understand these aspects.

ANNEX 3

MODELS USED FOR FISHERIES MANAGEMENT AND MPAs

Many types of models exist for fisheries management, such as stock assessment and bioeconomic models. Here the focus is on models that are particularly relevant to MPAs in a fisheries context and which address MPA effects on fish mortality, networks of MPAs for sustaining fish populations, and risk management.

MODELLING THE EFFECTS OF MPAs ON FISH MORTALITY

If fishing effort in an area to be protected by MPAs is eliminated, it is reasonable to expect fish mortality to be reduced by the same amount as the fraction of the catch foregone because of the MPA. For example, if the area to be protected by an MPA had accounted for 20 percent of the total catch, then fish mortality would be reduced by 20 percent. However, the actual reduction in fish mortality will be less, because the fishing effort is usually displaced to another area, rather than being eliminated. A key aspect of predicting the effects of a proposed MPA on fish mortality is to model what happens to effort displaced from an MPA.

One approach is to model the effects of an MPA by assuming that displaced fishing effort will be redeployed so as to maximize economic benefits. Benefits depend on costs and revenues. The cost of fishing may depend on the area fished, particularly as a function of the distance from fishing ports. Revenues also depend on the area fished as a function of the concentration of fish. While an MPA may be designed to reduce fish mortality on specific species, revenues may depend on area-specific concentrations of a broader group of species. Such models require spatial data on multispecies concentrations of fish and the cost differences.

Statistical or mathematical modelling techniques have been used to predict the likely reactions of fishers to area closures (see Box 11). These approaches allow scientists to evaluate in advance how effective fishing closures will be in achieving fish mortality targets. They also allow managers to take into account

the effects of the closed area on other species, so that they do not unknowingly cause overfishing as a result of effort redeployment. More-comprehensive modelling approaches have also been described in the scientific literature, although they are not routinely applied.[1]

Modelling networks of MPAs to sustain fish populations

The effectiveness of MPAs as a source of reproductive products depends on the amount of area protected and the mobility of the protected fish species. It also depends on the suitability of the habitat protected for the species of interest. For more-mobile species, more area needs to be protected to achieve the same amount of reproductive output. Patterns of dispersion and advection in the planktonic early-life-history stages of fish species, and the location of MPAs and spacing between them, determine whether populations within MPAs can be self-sustaining, independently of the intensity of fishing outside. Models have been developed to address these aspects of MPA design.[2] However, they require data on the movement patterns of juvenile and adult fish and the oceanographic currents that transport planktonic stages. The problem is further complicated by the behavioural patterns of larval fish, which migrate vertically in the water column depending on currents and light conditions, thus influencing how they are dispersed and advected.

Models to evaluate and manage risk through robust fisheries management

In fisheries management there is a need to understand risks (the probability that the outcome of a management decision will be 'negative'), and to develop the means to deal with those risks and the underlying uncertainties that produce them. This may involve two distinct tasks (Charles, 2001, Chapter 11):

- *Risk assessment* involves technical approaches to analysing uncertainty, measuring risks, and predicting the outcome of given harvesting and management scenarios within an environment of uncertainty. Risk assessment involves: (i) assessing the likelihood that certain undesired outcomes will occur; and (ii) assessing the impact or importance of the consequences if that outcome does occur. The relative importance of the risk is then a product of the likelihood and the impact. For example, a low likelihood of a hurricane may be more

[1] For example, Pelletier and Mahevas (2005) describe "A spatially explicit fisheries simulation model for policy evaluation".

[2] These models were reviewed in Botsford, Micheli and Parma, 2006.

important than a high risk of a more moderate storm. Risk assessment can be undertaken using sophisticated quantitative models, but can also be performed using qualitative methods, including stakeholder opinion.

- *Risk management* involves efforts to manage, reduce or otherwise cope with risks in fisheries both through technical (analytical) means designed to drive 'optimal' management plans in the face of uncertainty – perhaps to minimize certain risks or to balance risk and fishery benefits – and through structural (design) approaches involving the creation and adoption of robust management approaches and the precautionary approach. Risk management concerns decisions about the 'best' course of action in the face of risk.

The use of MPAs as a hedge against uncertainty is mentioned in several places in these Guidelines (e.g. in Chapter 3). A more comprehensive approach to risk assessment is to use so-called 'operating models', which represent the full range of uncertainties in fisheries management and help evaluate management options in terms of robustness. Operating models can represent fisheries and ecosystems spatially and they can include MPAs as a management tool, either in isolation or combined with other management measures. Such models do not reduce uncertainty, but they more realistically represent it, and they allow decision-makers to identify the options that are most robust to uncertainty in terms of achieving objectives. An example of a particularly complete operating model is 'Atlantis',[3] developed by Australian scientists. This model not only characterizes an entire ecosystem, but it also includes key elements of the management process such as implementation uncertainty.

[3] Atlantis was developed by Beth Fulton and Anthony Smith of Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia. It is being adapted for applications outside Australia. A PowerPoint presentation is available at www.ices06sfms.com/documents/Session No 1 (1 Smith.ppt, 341,32,AMS, phase 2, Atlantis).

ANNEX 4

CONFLICT MANAGEMENT

Conflicts over fisheries and marine resources have many dimensions including, but not limited to, power, technology, politics, gender, age and ethnicity. Conflicts take place at a variety of levels, from household to community, regional, societal and global scales. The intensity may vary from confusion and frustration over the directions fisheries management is taking to violent clashes between groups over resource property rights and responsibilities (Pomeroy and Riviera-Guieb, 2006).

SOURCES OF CONFLICT

Conflict may result from power differences between individuals or groups or through actions that threaten livelihoods. The use of natural resources is susceptible to conflict for a number of reasons (Buckles and Rusnak, 1999):

- Natural resources are embedded in an environment or interconnected space where actions by one individual or group may generate effects far off-site.
- Natural resources are embedded in a shared social space where complex and unequal relations are established among a wide range of social actors – fishers, fish traders, boat owners, government agencies, etc. Those actors with the greatest access to power are best able to influence natural resource decisions in their favour.
- Natural resources are subject to increasing scarcity due to rapid environmental change, increasing demand and their unequal distribution.
- Natural resources are used by people in ways that are defined symbolically. Aquatic species and coral reefs are not just material resources that people compete over, but are part of a particular way of life, an ethnic identity and a set of gender and age roles. These symbolic dimensions of natural resources lend themselves to ideological, social and political struggles that have enormous practical significance for their management and the process of conflict management.

TYPOLOGY OF CONFLICTS

Conflicts may arise due to different causes and at various levels. Generally speaking, conflicts can be categorized into four groups based on the central critical situation or the cause. Varying types of solutions may need to be sought depending on the cause of the conflict:

- *Data and facts:* These types of conflicts can often be resolved by obtaining additional data, carrying out more studies, etc.
- *Needs and interests:* These conflicts may occur over sharing the benefits of projects, choices in the allocation of resources, or the financing of external costs. This type of conflict is the focus of most conflict management.
- *Values:* Conflicts over values, where values can be defined as deeply held beliefs, are usually not amenable to negotiation or other conflict management approaches. Here the solution may be to agree to disagree.
- *Relationships:* These are often caused by personality conflicts and may be resolved through mediation by a third party.

Conflicts may be well-defined (sharp boundaries and constraints; clear solutions may exist) or ill-defined (unclear objectives and values; difficult to identify solutions). Relationships and the balance of power among the parties involved are important issues in all conflicts. Differing value systems may affect the relationship between the parties. Imbalances of power are not conducive to even-handed negotiation.

Fisheries and coastal management conflicts are usually multi-issue, multiparty conflicts, which adds to the complexity of dealing with them.

THE CONCEPT OF CONFLICT MANAGEMENT

Conflict management is about helping people in conflict develop an effective process for dealing with their differences. It is a voluntary and collaborative approach that recognizes that the parties in a dispute have diverse and frequently opposing views about the proper solution to a problem, but acknowledges that each group's views, from the group's perspective, may be both rational and legitimate. Thus, the goal of people working in conflict management is not to avoid conflict, but to develop the skills that can help people express their differences and solve their problems through collaboration.

The emphasis on the word 'voluntary', or mutually agreed on, is essential and refers to the fact that conflict management approaches will only work if all parties to the conflict are convinced that they will be treated fairly, or at least

may be better off by participating than they would be otherwise. This implies that as long as one of the parties feels that it can force its own solution, or could obtain a total victory at acceptable costs through the courts, or would actually benefit from no action, then conflict management approaches will not work.

CONFLICT ASSESSMENT

A first step in conflict management is assessment. An analysis of a particular conflict can provide insights into the nature, scope and stage of conflict and the approach(es) to its management. Four main factors should be analysed in determining the scope, nature and stage of a conflict:

- *Characterization of conflict and stakeholders:* The type of conflict encountered, the number of stakeholders, and the relationships among them. The nature and origin of conflict are analysed, as well as the balance of power among the parties.
- *Stage in the project cycle:* Conflicts at the 'beginnings' stage are likely to be different from conflicts at the implementation stage. New stakeholders may arise as the project proceeds. This requires that management be flexible and adaptive to changing circumstances.
- *Stage in the conflict process:* A determination of whether conflict is at a point at which interventions may be accepted.
- *Legal and institutional context:* The formal and informal institutions involved, the manner in which conflicts are resolved through them, and the formal legal doctrines or customary practices may influence the appropriate approach.

Five responses of people to conflict have been identified, depending on the importance of achieving a goal or maintaining personal relationships:

- *Accommodation*: When one party wants to maintain personal relationships with the other party, he or she may choose to accommodate the other party's goal.
- *Withdrawal*: One party may opt to avoid confrontation or withdraw from the conflict because he or she is neither interested in maintaining a personal relationship nor concerned with achieving a goal. Withdrawal can often persuade reluctant and more powerful parties to negotiate towards consensus.
- *Force*: One party holds more power over another party and is not concerned about damaging relationships and is keen on achieving the goal.

- *Compromise*: One party may have to give up something, which results in a 'win–lose' outcome.
- *Consensus*: Involves avoiding tradeoffs and seeking a 'win–win' outcome through better understanding of the issues at stake and negotiation.

APPROACHES TO CONFLICT MANAGEMENT

'Conflict management' is often used as the overarching term for both conflict prevention, or consensus-building, and conflict resolution. It refers to a variety of collaborative approaches, including conciliation, negotiation and mediation. They differ in the extent to which the parties in conflict control the process and outcome. *Conciliation or arbitration* consists of an attempt by a neutral third party to communicate separately with disputing parties to reduce tensions and reach agreement on a process for addressing a dispute. The third party has legal authority to impose a solution. *Negotiation* is a voluntary process in which parties meet 'face-to-face', with or without the assistance of a facilitator, to reach a mutually acceptable resolution of the issues in a conflict. *Mediation* involves the assistance of a neutral third party, a mediator, who helps the parties in conflict jointly reach agreement in a negotiation process, but has no power to direct the parties or impose a solution in a dispute. Through conflict resolution approaches, multiparty 'win–win' options are sought by focusing on the problem (not the person) and by creating awareness of interdependence among stakeholders.

Conflict resolution approaches are dependent on specific cultural, institutional and legal conditions, such as volunteerism, willingness to publicly acknowledge a conflict, and administrative and financial support for negotiated solutions, which may not be present in every context. Attitudes towards compromise, consensus or mediation vary. In some societies, openly discussing conflict may involve 'losing face'. Conflict resolution approaches may be counterproductive if the process brings groups together to mediate their differences when the causes of conflict and obstacles to resolution are beyond their control. There is also concern that a dependence on mediators to resolve conflict may develop, to the neglect of building local capacity to do so. In addition, there is a need to acknowledge that people may use other mechanisms, such as peer pressure, ostracism or public humiliation to resolve disputes. Western approaches to conflict management should be balanced with the systematic study of local practices, insights and resources used to manage conflict.

Multistakeholder analysis of problem areas and conflicts may serve as an aid to conflict management that is able address the complex interactions between stakeholders and natural resources at various levels. Such analysis offers a general analytical framework for examining the differences in interests and power relations among stakeholders, with a view to identifying who is affected by what and who can influence current patterns of natural resource management. This knowledge can facilitate *consensus-building.* Various methods such as PRA, participatory research, class, power and gender analysis can also be used.

Problem analysis from the points of view of all stakeholders can help separate the multiple causes of conflict and bring a wealth of knowledge to bear on the identification and development of solutions. When stakeholders come to recognize for themselves the common interests and strategic differences that connect them to each other, new opportunities can emerge for turning conflict into collaboration. This approach is especially appropriate in early, strategic stages of the planning process, to develop directions or strategies supported by a large number of stakeholders.

SELECTING AN APPROACH

Conflict is a dynamic process that generally progresses from initiation to escalation, controlled maintenance, abatement and termination/resolution. There are generally four stages to every conflict, with appropriate approaches to management:

- Potential or dormant conflict (consensus-building/relationship-building);
- Erupting conflict, with positions being developed (range of options, depending on the nature of conflict and relationship of parties);
- Evolving conflict, progressing towards a stalemate (mediation or arbitration) or towards resolution/abatement (no assistance or facilitation);
- Resolved conflict (depends on situation).

Choosing the correct approach through which to address a particular conflict is in itself a strategic choice. Parties to a dispute must first decide whether to seek resolution to a conflict through a non-consensual process or through more collaborative means. Once the decision has been made to use alternative conflict management processes, the parties must decide on which specific approach to employ. No single approach is effective in all cases. The circumstances of conflict and therefore the obstacles to agreement vary from one case to another.

Disputes may involve many or few parties, the problem may be more or less urgent, emotional investment of the stakeholders may vary, the public interest may or may not be at stake, and the factors involved may be well understood or may be uncertain. Gaining expertise in conflict management includes learning about the specific advantages and disadvantages of the various approaches, and assessing which is best for addressing a particular conflict situation.

FURTHER READING

The Forestry Policy and Planning Division of FAO, in close collaboration with the Regional Community Forestry Training Center (RECOFTC) in Bangkok, Thailand, has developed a comprehensive training package on Community-based Forest Resource Conflict Management. While focused on forestry, the process is also relevant to conflict management in fisheries and coastal resources (FAO and RECOFTC, 2002).

GLOSSARY

'(the) Area'
The seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction.
Source: United Nations, 1982, UNCLOS Part 1.

Benthic
Refers to organisms that live on or in the seabed.

Biodiversity (biological diversity)
The variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.
Source: CBD, 2000.

Bycatch
Organisms taken in a fishery that is targeting other species or another size range of the same species. That part of the bycatch with no economic value is usually discarded and returned to the sea, usually dead or dying.
Source: FAO, 2003a.

Ecosystem
An organizational unit consisting of an aggregation of plants, animals (including humans) and microorganisms, along with non-living components of the environment.
Source: FAO, 2003a.

Ecosystem approach (EA)
The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and equitable, sustainable use. It is based on the application of appropriate scientific methodologies focused on levels of biological organization that encompass the essential processes, functions and interactions among organisms and their

environment. It recognizes that humans, with their cultural diversity, are an integral component of ecosystems.
Source: CBD, 2000.

Ecosystem approach to fisheries (EAF)
An approach to fisheries management and development that strives to balance diverse societal objectives by taking into account knowledge and uncertainties regarding biotic, abiotic and human components of ecosystems and their interactions, and by applying an integrated approach to fisheries within ecologically meaningful boundaries. The purpose of EAF is to plan, develop and manage fisheries in a manner that addresses the multiple needs and desires of societies, without jeopardizing the options for future generations to benefit from the full range of goods and services provided by marine ecosystems.
Source: FAO, 2003a.

Ecosystem services
The conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfil human life. Examples include provision of clean water and food (fishery resources), maintenance of liveable climates (carbon sequestration), pollination of crops and native vegetation, and fulfilment of people's cultural, spiritual and intellectual needs.
Source: FAO, 2005a.

Exclusive economic zone (EEZ)
A zone under national jurisdiction (up to 200 nautical miles wide) declared in line with the provisions of the 1982 United Nations Convention on the Law of the Sea (UNCLOS), under which a coastal state has the right to explore and exploit, and the responsibility to conserve and manage, the living and non-living resources of the zone.
Source: FAO Fisheries Glossary (www.fao.org/fi/glossary/).

Fishery
The term 'fishery' can refer to the sum of all fishing activities for a given resource, for example, a hake or shrimp fishery. It may also refer to the activities of a single type or style of fishing for a particular resource, for example a beach seine fishery or trawl fishery. The term is used in both senses in this document and, where necessary, the particular application is specified.
Source: FAO, 2003a.

Fisheries management measures
Specific controls applied in a fishery to contribute to achieving the objectives, including input controls (fishing effort limitations), output controls (catch quotas), technical measures (gear regulations, closed areas and time closures), and socio-economic incentives (access and use rights).
Source: Cochrane, 2002.

Fisheries refugia
Spatially and geographically defined marine or coastal areas in which specific management measures are applied to sustain important species (fishery resources) during critical stages of their life cycle, with a view to their sustainable use.
Source: UNEP-SCS, no date.

Fishing capacity
The amount of fish (or fishing effort) that can be produced for a period of time (e.g. a year of a fishing season) by a vessel or a fleet that is fully utilized and for a given resource condition.
Source: FAO Fisheries Glossary (www.fao.org/fi/glossary/).

Fishing effort
The total amount of fishing activity on the fishing grounds over a given period of time, often expressed for a specific gear type, for example number of hours trawled per day, number of hooks set per day or number of hauls of a beach seine per day. Fishing effort would frequently be measured as the product of: (i) the total time spent fishing, and (ii) the amount of fishing gear of a specific type used on the fishing grounds over a given unit of time. When two or more kinds of gear are used, they must be adjusted to some standard type in order to derive an estimate of total fishing effort.
Source: FAO, 2003a.

Fish mortality
Fish mortality (F) refers to the proportion of the available fish being removed by fishing. It is usually expressed as an instantaneous rate and should reflect all deaths in the stock due to fishing, not just the fish actually landed. For management purposes, it is important to consider how F is distributed among age groups (based on Restrepo, 1999.)
Source: FAO, 1997; and FAO Fisheries Glossary (www.fao.org/fi/glossary/).

Fish population
A group of fish of one species that shares common ecological and genetic features and occupies the same geographical space. The fish stocks defined for the purposes of stock assessment and management do not necessarily coincide with self-contained populations.
Source: Based on Restrepo, 1999.

Fish stock (fishery resource)
The living resources in the marine community or fish population from which catches are taken in a fishery. In a particular fishery, the fish stock may be one or several species of fish, but the definition is also intended to include commercial invertebrates and plants. From the fisheries management point of view, the most suitable definition of 'stock unit' is probably the one provided by Gulland (1969; 1983), who proposed, on operational criteria and practical grounds, that a group of fish can be treated as a 'stock' and managed as an independent unit if the results of assessment and the impact of management measures do not differ significantly from what they would be in the case of a truly independent stock.
Source: FAO, 2006.

Governance
The formal and informal arrangements, institutions, and mores that determine how resources or an environment are utilized; how problems and opportunities are evaluated and analysed, what behaviour is deemed acceptable or forbidden, and what rules and sanctions are applied to affect the pattern of resource and environmental use.
Source: Juda, 1999.

High seas
UNCLOS uses this term to include everything not within any country's EEZ, territorial sea, internal waters, contiguous zone or archipelagic waters. The seafloor beyond national outer continental shelves (OCS), extending from territorial seas to a distance between 200 and 350 nautical miles from the baseline, and in which countries have rights regarding the exploitation of non-living marine resources and sedentary living resources on or in the seabed, is referred to as 'the Area' (q.v.). In this document, the terms 'high seas and 'areas

beyond national jurisdiction' are used to refer to both the Area and the high seas according to the UNCLOS definitions.
Source: FAO, 2007a.

Integrated management
Integrated management (whether of oceans, coasts, watersheds, etc.) is a term used for several approaches, or mechanisms, for managing multiple (competing) uses of a certain designated area (e.g. integrated coastal [zone or area] management – ICM, ICZM, ICAM – and integrated ocean management – IOM). These uses include sectors such as fisheries, aquaculture, forestry, oil and gas, mining, agriculture, shipping and tourism. Integrated management involves managing multiple stakeholders (e.g. local communities and industries), as well as interactions among people and other components of ecosystems, and among multiple levels of government. There are several approaches to integrated management.
Source: FAO, 2008b.

Livelihood
A means of securing the necessities of life. A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets, both now and in the future, while not undermining the natural resource base (based on Chambers and Conway, 1992).
Source: FAO Fisheries Glossary (www.fao.org/fi/glossary/).

(Marine) community
A group of ecologically-related populations of various species of organisms occurring in a particular place and time. NB: Not to be confused with a human community.
Source: UNEP-WCMC Glossary of biodiversity terms (www.unep-wcmc.org/reception/glossary.htm).

Monitoring, control and surveillance (MCS)
Activities undertaken by the fishery enforcement system to ensure compliance with fishery regulations. A suite of MCS activities includes: (i) *Monitoring* – the collection, measurement and analysis of fishing activity, including, but

not limited to: catch, species composition, fishing effort, bycatch, discards, area of operations, etc.; (ii) *Control* – the specification of the terms and conditions under which resources can be harvested; and (iii) *Surveillance* – the regulation and supervision of fishing activity to ensure that national legislation and terms, conditions of access and management measures are observed.
Source: FAO, 2005b.

Open-access fishery
A condition describing a fishery open to anyone who wants to fish.
Source: FAO, 2003a.

Reference point
A reference point indicates a particular state of a fisheries indicator corresponding to a situation considered desirable ('target reference point'), or undesirable and requiring immediate action ('limit reference point' and 'threshold reference point'). Also referred to as a 'reference value'.
Source: Caddy and Mahon, 1995.

Resilience
Resilience is the capacity of a system to absorb disturbance and reorganize while undergoing change, so as to still retain essentially the same function, structure, identity and feedbacks of regulation mechanisms.
Source: Based on Walker *et al.,* 2004.

Recruitment (to a fishery)
The number of fish added to the exploitable stock in the fishing area each year, through reproduction and growth of young fish to an exploitable size or migration (i.e. the fish move into the fishing area).
Source: FAO Fisheries Glossary (www.fao.org/fi/glossary/).

Sedentary (species)
Sedentary organisms have been defined, at the harvestable stage, as either immobile on or under the seabed or unable to move except in constant physical contact with the seabed or the subsoil (FAO Fisheries Glossary, based on UNCLOS Article 77[4]). However, in this document "sedentary organisms are those whose movements are short-range when compared with the spatial

scale of the fishing process (fleet displacements) or pelagic larval dispersal" (Hilborn *et al.*, 2004, 200).
Source: FAO Fisheries Glossary (www.fao.org/fi/glossary/); and Hilborn *et al.*, 2004.

Shadow price
In economic analysis, this is the true economic price of a good or service. It is calculated based on the opportunity cost for those goods and services that do not have a market price, perhaps because they are set by government. Shadow-pricing is often used in cost–benefit analysis when the purpose is to capture all the variables involved in a decision, not merely those for which market prices exist.
Source: The Economist (www.economist.com/research/economics/alphabetic.cfm?letter=s).

Stakeholder
Any individual, group, organization or sector in society that has a clearly identifiable interest in the outcome of a policy or decision-making situation. The interest may be in the form of a specific management responsibility, a commercial interest (resource supply, revenue, employment, trading activity), a subsistence need or some other commitment, as a member of civil society.
Source: FAO, 1999.

Sustainable use of living marine resources
The use of living marine resources in a way and at a rate that does not lead to the long-term decline of their productive capacity, thereby maintaining their potential to meet the needs and aspirations of present and future generations.
Source: Based on Cochrane, 2002.

Sustainable yield
The amount of biomass or the number of units that can be harvested currently in a fishery without leading to long-term decline of the population.

Target species
Those species that are primarily sought by the fishers in a particular fishery: the subject of directed fishing effort in a fishery. There may be primary as well as secondary target species.
Source: FAO, 2003a.

Use, management and property rights

Fisheries management measures can be seen from the perspective of use rights, that is, the rights held by fishers and communities that define by whom and how the fishery resources can be used. Use rights can be divided into two categories: access rights and withdrawal rights. Rights to participate in the management of the resources are referred to as management rights. Both use rights and management rights fall under the overall heading of property rights, describing the relationship between people and various forms of property.

Source: Charles, 2002; and FAO, 2005c.

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This document has been developed to provide information and guidance on the use of marine protected areas (MPAs) in the context of fisheries. As MPA implementation moves ahead in the arena of marine biodiversity conservation, many people feel that the fisheries aspects are not fully understood nor always appropriately taken into account, and that guidance specific to this sector is needed. These Guidelines look specifically at fisheries features of MPAs, but also address the interface between fisheries management and biodiversity conservation and provide support for MPAs with multiple objectives.

The Guidelines are divided into two sections: the first discusses definitions and context, and provides background information on fisheries management, the ecosystem approach to fisheries (EAF) and MPAs as a tool for fisheries management, including socio-economic and biological impacts. The second section considers the planning and implementing of MPAs including the institutional, legal and policy context, the planning process and actual implementation considerations. Conclusions and future directions are offered in the last chapter of this section, while a selection of annexes offers in-depth information on a few key issues.

The document highlights the need for increased coordination across sectors and agencies/departments. Integration of diverse interests and viewpoints is required if we are to successfully manage our oceans and their resources for future generations. As with all fisheries management, good governance – including adequate stakeholder participation – is key to successful and equitable management outcomes.

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